

**IN THE UNITED STATES DISTRICT COURT  
FOR THE SOUTHERN DISTRICT OF ILLINOIS**

CALEB BARNETT, et al.,  
Plaintiffs,

**V.**

KWAME RAOUL, et al.,  
Defendants,

DANE HARREL, et al.,  
Plaintiffs,

**V.**

KWAME RAOUL, et al.,  
Defendants,

JEREMY W. LANGLEY, et al.,  
Plaintiffs,

**V.**

BRENDAN KELLY, et al.,  
Defendants,

FEDERAL FIREARMS LICENSEES OF  
ILLINOIS, et al.,  
Plaintiffs,

**V.**

JAY ROBERT “J.B.” PRITZKER, et al.,  
Defendants.

Case No. 3:23-cv-209-SPM  
\*\*designated Lead Case

Case No. 3:23-cv-141-SPM

Case No. 3:23-cv-192-SPM

Case No. 3:23-cv-215-SPM

**DECLARATION OF J. BUFORD BOONE, III**

I, J. Buford Boone, III, declare as follows:

1. I am at least 18 years old and have personal knowledge of the statements contained in this Declaration.

2. The statements contained in my expert report that I authored in this case, dated May 10, 2024, and attached hereto as **Exhibit 1**, are true and accurate.

3. The statements contained in my expert rebuttal report that I authored in this case, dated June 10, 2024, and attached hereto as **Exhibit 2**, are true and accurate.

4. If called to testify at trial in this case, I would testify to the matters set forth in my expert report provided in the above-captioned cases. My testimony would be consistent with all of the statements in the report, which included a complete statement of all opinions expressed, the basis and reasons for such opinions, the facts and data considered by me in forming said opinions, discussion about and identification of my qualifications as an expert witness (including any publication I may have authored in the previous 10 years and any cases during the previous 4 years where I may have testified as an expert at trial or by deposition), and a statement of compensation paid to me for study and testimony in this matter.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on September 12, 2024 within the United States.

A handwritten signature in black ink, appearing to read "J. Buford Boone, III", is written over a horizontal line.

J. Buford Boone, III  
Declarant

# **EXHIBIT 1**

**EXPERT REPORT OF J. BUFORD BOONE, III**

**Subject Matter**

1. I have been asked by Plaintiffs to make general comments/observations on subjects related to Illinois HB 5471 and declarations of various experts hired by the state of Illinois.

**Compensation**

2. I am being compensated for my time in this case at the rate of \$700 per hour. My compensation is not contingent on the results of my analysis or the substance of my testimony.

**Background and Qualifications**

3. I am currently the sole member of Boone Ballistics, LLC and a retired Supervisory Special Agent (SSA) of the Federal Bureau of Investigation (FBI). I was the primary SSA with oversight of the FBI Ballistic Research Facility (BRF) from April 15, 1997 – August 31, 2012.

4. As the Member of Boone Ballistics, LLC, I have been employed as an expert witness in civil and criminal cases. Additionally, I have been employed as a consultant in civil and criminal cases. I teach internal, external and terminal ballistics, including selection of ammunition and weapons for efficiently incapacitating an aggressive human adversary. I have lectured on the applicability of the Hague Convention of 1899 to the selection of ammunition for use by the U.S. Military. I conduct time of flight testing to better document small arms projectile flight as it applies to the use of a Ballistic Coefficient to predict projectile impact at long distances.

5. Prior to my first full-time law enforcement employment, I served as a reserve police officer or Deputy Sheriff with Tuscaloosa County, Alabama, Upson County, Georgia, Las Animas County, Colorado and Trinidad Colorado.

6. Approximately May of 1988 I was hired as a Police Officer with the Tuscaloosa, Alabama, Police Department. I was subsequently offered a position as a Special Agent of the Federal Bureau of Investigation (FBI) in July of 1988. I began employment with the FBI on 07/25/1988. I was graduated from the FBI Academy on 10/21/1988. My first duty station was New Haven, Connecticut.

7. I have maintained an interest in firearms all my adult life. I have shot competitively. My firearms scores at the FBI Academy were sufficiently high to allow me to attempt the “Possible” Club. I was successful on my first attempt. To shoot a “Possible”, Agents must fire a perfect score on a very difficult course. Though there were in excess of 10,000 Agents in 1988, my “Possible” was approximately number 1,198 in FBI history.

8. Upon arrival in New Haven, I was assigned to the Reactive Squad conducting background, bank robbery and fugitive investigations. I later served as the Fugitive Coordinator for the New Haven Division. I was named “Detective of the Month” by the Bronx Homicide Task Force for the capture of an America’s Most Wanted fugitive.

9. I successfully completed FBI Firearms Instructor School in July of 1989. This qualified me to teach firearms to Field Agents.

10. I was transferred to the Organized Crime/Narcotics Squad in July of 1990. I primarily participated in investigations of drug gangs. These investigations typically involved significant amounts of surveillance, electronic monitoring and the service of multiple search warrants. I also participated in organized crime investigations. I have participated in multiple arrests in urban and suburban areas.

11. I was named the Principal Firearms Instructor (PFI) of the New Haven Division of the FBI in November of 1992. I maintained that position until I transferred to the Firearms Training Unit at the FBI Academy, Quantico, Virginia.

12. As PFI, I oversaw all firearm and defensive tactics training of the 90+ Agents in the New Haven Division of the FBI. I coordinated training sessions for all firearms issued to general Agents. This included revolvers, pistols, carbines and shotguns. It also included coordination of deadly force training with the Principal Legal Advisor. During my time as the PFI, the FBI transitioned from revolvers to semiautomatic pistols. The training for this transition was my responsibility for New Haven Division Agents.

13. In September of 1989 I was admitted to the FBI New Haven Special Weapons and Tactics (SWAT) Team as a Sniper/Observer. I successfully passed both the two week Sniper/Observer and the two week Basic SWAT courses at the FBI Academy. I served operationally on the New Haven SWAT Team until my transfer to the FBI Firearms Training Unit at the FBI Academy, Quantico, Virginia.

14. In March of 1996, I was promoted to a position as a Term GS-14 Firearms Instructor at the Firearms Training Unit (FTU), FBI Academy, Quantico, Va. During this assignment, I performed line and PFI instruction of Agent trainees. I provided or oversaw line and combat instruction in handguns, carbines and shotguns. I also provided judgmental instruction utilizing Firearms Training Simulator (FATS) equipment. The FATS training was used primarily to teach Agents when the use of deadly force was appropriate, and when it was not.

15. I was transferred to the Ballistic Research Facility (BRF) of the FTU on April 15, 1997. I maintained my position at the BRF for more than 15 years, retiring on August 31, 2012. I received a permanent promotion to Supervisory Special Agent in September of 1997.

16. The BRF has responsibility for testing and evaluating all ammunition used operationally by the FBI. The BRF was created following a 1986 shootout wherein a subject was fatally injured by FBI projectiles but continued fighting and ultimately killing two Agents after receiving the "fatal" wound. A thorough investigation revealed the primary cause of the failure to rapidly incapacitate the subject was the projectiles lack of sufficient penetration in the subject's body. It stopped short of the heart.

17. This investigation spawned research into the mechanics of wound ballistics. Ultimately, the research led to the creation of a scientifically repeatable method of comparing the

potential effectiveness of individual cartridges. The resultant test has been referred to as the “FBI Method”. The BRF published test findings, available upon official request of Law Enforcement and Military agencies. The BRF became the most trusted source of ballistic information in the Law Enforcement and Military community.

18. As SSA of the BRF, my responsibility was to oversee all aspects of the research. I was the only full-time person at the BRF until a support person (non-Agent) was assigned as an Engineering Technician, Ballistics (ETB), in the last quarter of 1998. I was the Supervisor and rating official of the ETB.

19. As SSA, I performed or directed all functions of the BRF. I hand loaded cartridges, put test firearms together, hand-fired firearms for testing, built tissue simulant blocks, conducted penetration testing and reported on same. I created a relational database to store data and report test results. I operated sophisticated ballistic testing and photographic equipment. I was frequently sought out to train others in the use of this equipment.

20. I was the primary author of specifications for ammunition procurements for the FBI. This included ammunition used for training as well as for operational use, commonly referred to as “Service” ammunition.

21. I was the primary author of the FBI Body Armor Test Protocol at its inception.

22. I directed the creation of a procurement of 5.56mm NATO ammunition using piezoelectric conformal transducers for pressure testing.

23. The BRF served as the primary source of ballistic information regarding ammunition and firearms for all FBI Agents. Field Agents routinely referred local and state partners to me for ballistic information and advice.

24. During my service at the BRF, a strong liaison was formed with the Department of Defense (DOD). The BRF performed testing for and consultation with the DOD on many occasions. My expertise has been, and continues to be, sought out and relied upon by the Special Operations Community. During my service at the BRF, the Department of Defense Law of War Chair established protocol that all new DOD small arms munitions required testing and evaluation by the FBI BRF prior to legal authorization being granted for their use.

25. I have been a participant in a number of government sponsored Integrated Product Teams researching ballistics, including:

- Joint Services Wound Ballistics
- Lead Free Ammunition
- Protective Armor
- Armor Piercing Ammunition development

26. In 2002, I traveled to Darligen, Switzerland, at the specific request of the Department of State, to represent the United States in discussions of wound ballistics.

27. I have provided numerous live-fire terminal ballistic demonstrations to local, state and federal law enforcement officers as well as to all branches of the United States Military.

28. I have conducted international presentations on wound ballistics, ammunition selection, weapon selection, sniper operations and body armor.

29. I have briefed the Secretary of the Army and provided, at his request, my professional opinion of a 5.56mm NATO cartridge intended to replace the M855.

30. I have functioned (and continue to) as the primary instructor of 58 Basic Law Enforcement Sniper/Observer schools. Approximately 1,113 students have successfully completed this course under my instruction.

31. I consistently received high performance ratings in the FBI. I received the highest possible, "Outstanding", each of the last 4 years of my service. I have received numerous letters of commendation and performance awards.

32. I was the 2008 recipient of the National Defense Industrial Association Joint Armaments Committee's Gunnery Sergeant Carlos Hathcock Award.

33. I currently teach a two-hour basic wound ballistics class for recruits at the Law Enforcement Academy-Tuscaloosa, a branch of the Alabama Peace Officers Standards & Training Commission. I also teach an annual eight hour wound ballistics and ammunition selection class at the Tuscaloosa Police Department, Tuscaloosa, Alabama.

### **Publications**

34. Publications I authored during my FBI employment and restricted to official law enforcement or government request:

Review of Accuracy 1st Training  
Weapon Selection – Revision III  
Ammunition Selection 2007  
TSWG MURG Briefing Accuracy Expectations  
AIM III TSWG Briefing 3/16/2010  
Wound Ballistics  
B2 Sniper Rifle Cleaning Method

35. Publication I authored during my FBI employment that is publicly available:

FBI Body Armor Test Protocol

36. Publication that I have co-authored that is publicly available:

Terminal Ballistics: The Science of Ballistic Projectile Wounding

## **Opinions and Analysis**

### ***The Restricted weapons***

37. It is my understanding that the challenged Illinois law generally bans as “assault weapons” the following types of firearms (among others):

- a. semiautomatic rifles that accept detachable magazines or that may be readily modified to accept a detachable magazine and have one or more of the following features:
  - i. a pistol grip or thumbhole stock;
  - ii. any feature capable of functioning as a protruding grip that can be held by the non-trigger hand;
  - iii. an adjustable, telescoping, folding, thumbhole, or detachable stock, or a stock that is otherwise foldable or adjustable in a manner that operates to reduce the length, size, or any other dimension;
  - iv. a flash suppressor;
  - v. a grenade launcher and
  - vi. a shroud attached to the barrel or that partially or completely encircles the barrel, allowing the bearer to hold the firearm with the non-trigger hand without being burned, but excluding a slide that encloses the barrel. *Note: I am unaware of any item traditionally found on semiautomatic or automatic rifles that is referred to as “a slide that encloses the barrel”. I am at a loss to understand what is meant by this language.*
- b. semiautomatic pistols that accept detachable magazines or that may be readily modified to accept a detachable magazine and have one or more of the following features:
  - i. a threaded barrel;
  - ii. a second pistol grip or another feature capable of functioning as a protruding grip that can be held by the non-trigger hand;
  - iii. a shroud attached to the barrel or that partially or completely encircles the barrel, allowing the bearer to hold the firearm with the non-trigger hand without being burned, but excluding a slide that encloses the barrel;
  - iv. a flash suppressor;



- v. the capacity to accept a detachable magazine at some location outside of the pistol grip; and
  - vi. a buffer tube, arm brace, or other part that protrudes horizontally behind the pistol grip and is designed or redesigned to allow or facilitate a firearm to be fired from the shoulder.
- c. semiautomatic shotguns that have any one of the following features:
- i. a pistol grip or thumbhole stock;
  - ii. any feature capable of functioning as a protruding grip that can be held by the non-trigger hand;
  - iii. a grenade launcher
  - iv. a fixed magazine with the capacity of more than 5 rounds; or
  - v. the capacity to accept a detachable magazine.

***The Restricted weapons are not just suitable for self-defense, but well suited for it***

38. Any claim that semiautomatic rifles with the features the challenged law singles out like the AR-15 are not suited for self-defense is contradicted by a report from the U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives (“ATF”) titled “Data Analysis of .223 Caliber Ammunition,” a copy of which is included herewith as **Exhibit A**.

39. This report relies heavily on data from the “FBI Weapons Selection” test that I authored. After comparing the terminal performance of the projectiles launched using typical service cartridges of handguns chambered in 9mm Luger and .40 S&W with those for rifles chambered in .223, the ATF report concludes that a shoulder-fired rifle chambered in .223 is the “weapon of choice.”

40. Specifically included was their usefulness inside structures and their threat level to innocent bystanders. The report explained that ballistic studies have shown that certain .223 rounds discharged from a rifle were less likely to over-penetrate barriers commonly found in structures than certain common rounds fired from handguns (9mm and .40S&W) and more likely to provide the recommended level of 12”-18” of penetration.

41. In other words, such rifles are extremely well suited for self-defense, including within confined areas like a home.

42. The suitability of such rifles for self-defense explains why law enforcement uses them. Law enforcement is, obviously, not the same as the military, and law enforcement officers have different responsibilities and authority than ordinary citizens. But like ordinary civilians, law enforcement officers face the need to defend themselves. Based on my experience, what they

overwhelmingly use for that purpose are semiautomatic rifles that use detachable box magazines and have pistol grips and other features the challenged law singles out.

43. As previously stated, I am a retired law enforcement officer. My former agency (FBI) uses AR-15 type firearms. I train law enforcement officers and have trained them in the use of AR-15 type firearms. The often quoted mission of law enforcement is “To Protect and Serve”. In my experience, the predominant type of rifle currently used by law enforcement is an AR-15 type and is appropriate for that purpose.

44. The State of Illinois apparently agrees with me, as the law contains exemptions for law enforcement personnel, including retired officers. It further contains exemptions for government agencies, prison officials and certain private security contractors – none of whom are expected to “go to war” as part of their official duties.

### ***Projectile (bullet) vs. Firearm***

45. It is an undisputable fact that the projectile (bullet – the part launched by the firearm) is solely responsible for causing physical damage to tissue. It is physically impossible for the performance of the projectile to be influenced by physical characteristics of the firearm such as: pistol grip, thumbhole stock, telescoping stock, barrel shroud, etc. In fact, if two cartridges from the same box of ammunition were fired from two rifles with identical barrels (chamber size, length and twist rate) but differing to the extent that one was banned by the Illinois law and the other wasn't, the terminal effect would be substantially identical.

46. Absent specifics regarding the cartridge used, statements regarding the wounds created by projectiles fired by an AR-15 are incomplete and misleading. Ascribing wounding ability to a type of firearm is akin to ascribing speed to a style of vehicle – “Two door cars are faster than four door cars” – even the layman can see the fallacy in that type of posturing.

47. The only part of the firearm that significantly influences the performance of the projectile is the barrel. Longer barrels, up to a point, produce higher linear velocity. Faster twist rate barrels produce higher rotational velocity. Because barrel design is irrelevant as to a firearm's status as an “assault weapon” under the law, the claim that “assault weapons” cause more damage than non-“assault weapons” is objectively false. A non-“assault weapon” rifle (e.g., a semiautomatic rifle without any of the enumerated features) having an identical barrel to and firing the identical cartridge as an “assault weapon” will exhibit virtually the same projectile effect on a target at impact.

48. I am aware of AR-15 type weapons chambered in cartridges from .22LR to .50 Beowulf. The AR-10 series (larger but functionally similar to the AR-15) is also banned by this law and includes chamberings up to at least .300 Winchester Magnum.

49. To my knowledge, Illinois is the only state that treats rifles chambered for rimfire ammunition the same as rifles chambered for centerfire ammunition.

50. The FD338 is a semiautomatic rifle chambered in .338 Lapua magnum. It contains features that would render it banned under this law. It is advertised as “The world’s finest .338 Lapua Magnum AR”.

51. Within each caliber there are multiple types of projectiles. With respect to the .223 Remington, I am aware of projectile weights from 40 to 90 grains. In general terms, it is reasonable to believe that the lighter projectile weights will be launched with higher velocity than the heavier projectile weights. Without specifying the actual loading, it is impossible to accurately state a muzzle velocity.

52. Projectiles are manufactured using multiple methods. Those designing projectiles intentionally change design characteristics to attain desired terminal performance goals. It is not uncommon to have two cartridges that will fire in the same rifle but have drastically differing terminal performance. Therefore, attributing any terminal effect to a projectile impact based solely on the launch platform (i.e., the firearm) is misleading and, perhaps, disingenuous.

53. Cartridges typically are manufactured with varying types of projectiles. For example, I have consulted with the U.S. Military on the effectiveness of at least the following 5.56mm NATO cartridges (all of which are intended to be used in the M16 family of firearms) which contain different projectiles:

M193 – A 55 grain 2-part projectile consisting of a copper jacket and a lead slug.

M855 - A 62 grain 3-part projectile consisting of a copper jacket, a lead slug and a steel penetrator.

M855 A1 – A 62 grain 3-part projectile consisting of a copper jacket, a non-lead slug and a steel penetrator.

MK318 Mod-1 SOST – A 62 grain 2-part projectile containing a copper jacket and a non-lead slug.

Mk 262 Mod-1 - A 77 grain 2-part projectile consisting of a copper jacket and a lead slug  
The reason there are varying projectiles is that there are varying purposes. Traditionally, projectiles designed to uniformly expand (soft nose, etc) are used for hunting while the military has used full metal jacket projectiles. It is my opinion that the main reason the traditional military projectile design has historically been full metal jacket is to enhance reliability in automatic weapons. The State of Illinois specifically forbids the use of “Non-expanding military style full metal jacket bullets” for harvesting white-tailed deer while requiring the use of “only soft point or expanding bullets...”

54. Based on the above, it is my opinion that any statement as to specific gunshot tissue damage which does not specify, at a minimum, the cartridge, projectile and velocity should be discarded as incomplete.

55. Also based on the above, it is my opinion that any statement as to specific gunshot tissue damage which is attributed only to a style of firearm should be discarded as erroneous.

56. Furthermore, when discussing the totality of firearms banned under this law, discussions centering on the .223 Remington/5.56mm NATO are curious, as that is at the lower end of the centerfire rifle options available. One must wonder why it is singled out while cartridges with far more wounding potential are ignored.

57. Finally, it is telling that the U.S. Military is in the process of moving away from the 5.56 in favor of a larger caliber. The U.S. Army has recently made the decision to move from 5.56mm to 6.8mm ammunition. To quote Brigadier General William Boruff's statement in the April 20, 2022 Brief to the Media on the Next Generation Squad Weapon: "However, the current 5.56 cartridge has been maxed out from the performance perspective. The new weapon, with its increased operating pressure and size allows the Army to significantly increase the performance capability of the ammunition." One needs to look no further than the U.S. Army contract, awarded to Sig Sauer, for the Next Generation Squad Weapons System (NGSW). To quote from the press release issued by Sig Sauer on April 20, 2022: "The XM250 (SIG-LMG lightweight belt-fed machine gun) and XM7 (SIG MCX-SPEAR Rifle) are purpose-built to harness the energy of the SIG FURY 6.8 Common Cartridge Ammunition enabling greater range and increased lethality while reducing the soldier's load on the battlefield".

58. Inasmuch as the term "lethality" has entered the discussion, it is my opinion that the term is misleading, similar to "excessively dangerous firearms". All firearms are capable of launching a projectile which inflicts an injury that leads to death. There is no greater individual danger than death. "Lethality" is a word commonly used in the military community. It is my opinion that a more appropriate word would be "effective". There are no degrees of lethal. Death is a finality. Death frequently takes time. People are capable of receiving a lethal wound and continuing to harm others before expiring. If someone dies as a result of an injury a month earlier, it was 100% lethal. The "lethality" of a system is of little consequence if the person it is applied to kills you before he expires.

### ***Energy (Kinetic Energy)***

59. Energy, alone, is a sophomoric method of describing the effectiveness of a projectile launched by a firearm. It is notable that knife and arrow wounds typically have very little energy as compared to firearm launched projectiles, yet are capable of inflicting great injury.

60. The energy value is more heavily influenced by velocity than mass, as the velocity is squared.  $\text{Energy} = \text{bullet weight (grains)} * \text{Velocity}^2 (\text{fps}) / 450,400$

61. As previously stated, the banned firearms are offered in a large selection of chamberings. Based on a cursory review of projectiles and launch velocity, it is reasonable to say that AR-type rifles have the ability to launch projectiles with muzzle energy in the range of less than 100 (rimfire cartridges) to above 5,000 ft.-lbs. A similar comparison could be made of most all other firearms. A 55 grain projectile launched at 3,000 feet per second possesses 1,099 foot pounds of energy when fired from a handgun just as it does from a rifle. It is curious that the state

of Illinois has an energy requirement for handgun ammunition (500 foot pounds at the muzzle) but does not have a similar requirement for shotguns or muzzleloading rifles. It is a fact that the type of firearm used to launch the projectile has absolutely no bearing on the amount of energy required to humanely dispatch that animal. It is also curious that the state does not allow the use of .223/5.56mm ammunition which typically has more than twice the 500 foot pounds of energy required for handgun ammunition. None of the banned features has any measurable effect on the velocity or energy of the projectile.

62. Additionally, if one was to assign value to energy, knowledge of the amount of energy transferred would be necessary to estimate wounding potential. This is best demonstrated by comparing two projectiles with identical energy:

The construction of projectile A results in it passing completely thru the body and continuing.

The construction of projectile B results in total fragmentation, all pieces of which remain in the body.

63. They cannot be considered equal as projectile B obviously transferred more energy than projectile A.

64. Illinois does not limit its energy requirement inconsistencies to firearms. The energy of an archery projectile (arrow or bolt) can be calculated in the same way as firearm projectiles. Illinois requires a draw weight and arrow length of 30lbs/20 inches for long, recurve or compound bows. However, they require a draw weight and arrow length of 125/14 for crossbows. Draw weight is a component of energy imparted to the arrow. Generally speaking, increased draw weight equates to increased velocity. As the relationship of velocity to energy involves squaring velocity, it is easy to see that an arrow launched by the minimum crossbow specified possesses far greater energy than one launched by the minimum bow specified. It is unrealistic to believe that the state of Illinois assumes crossbow hunters go after much larger/tougher game than bow hunters. Therefore, I am at a loss to explain the inconsistency in Illinois hunting regulations.

65. Based on the above, it is my opinion that any claim as to specific gunshot tissue damage which is based solely on kinetic muzzle energy should be discarded as incomplete.

#### ***Rate of fire/Rounds per minute***

66. Claims made about increased rounds per minute causing more victims and injuries per event are misleading. A round is one complete cartridge. Some rounds have multiple projectiles. As previously pointed out, it is the projectile which causes injury.

67. "Cyclic Rate" is a term used to describe the rate at which a succession of movements repeats itself: in a firearm, it is usually expressed in shots per minute that are theoretically possible to be fired, given an unlimited supply of ammunition. It does not consider, for example, the time required to recover from recoil or manipulate the trigger. "Shots" is

synonymous with “rounds”. Therefore, cyclic rate should be considered synonymous with “Rounds Per Minute”. A firearm’s cyclic rate is theoretically the same in semiautomatic as it is in fully automatic. Firearms using handgun cartridges typically have a shorter cyclic rate due to shorter cartridge and action length.

68. It makes sense that the intent of the authors of any law designed to limit firearms with a high cyclic rate would be to limit the rate at which projectiles could be launched, rather than simply focusing on the generic cyclic rate.

69. There are many different types of rounds. The projectile, the part that is actually expelled forward of the firearm, is solely responsible for creating wounds. For example, an M-16 firing blank rounds has far less potential to wound than the same rifle firing M855 rounds. Therefore, equating rounds per minute with projectiles launched is misleading without identifying the rounds being considered.

70. An example of the peculiar selectivity of the law is the failure to exclude shotguns with large diameter shot. The 12 gauge shotgun with a 3” cartridge of #4 buckshot fires 41 .24 caliber supersonic projectiles with each pull of the trigger – yet is not banned under this law.

71. The maximum overall length of a .223 cartridge is 2.260” so it is reasonable to expect the “cyclic rate” or “rounds per minute rate” of a 3” semiautomatic shotgun to be slightly longer than that of an M16 but the difference is inconsequential. (Cyclic rate ignores shooter management of recoil). Even if the cyclic rate of the shotgun was twice that of the M-16, its projectile launch rate would be over 20 times that of the M-16.

72. The law does, however, ban semiautomatic shotguns that have “a fixed magazine with the capacity of more than 5 rounds”. When looking at the 12 gauge, cartridges are available in sizes from 1.75” to 3”. A tubular shotgun magazine which accepts four 2.75” cartridges would accept six 1.75” cartridges. There are many semiautomatic shotguns which are capable of accepting four 2.75” cartridges. Inasmuch as the law does not address shotgun cartridge length, it bans all of those shotguns.

73. With respect to the rate of fire relevant in this case, the Seventh Circuit stated the following: “Better data on firing rates might change the analysis of whether the AR-15 and comparable weapons fall on the military or civilian side of the line. We note in this connection that it is one thing to say the AR-15 is capable of firing at a rate of 300 rounds per minute and the comparable rate for the M-16 is 700 rounds per minute, but quite another to address actual firing capacity, which accounts for the need to change magazines. No one here has suggested that the M16 comes with a 700-round magazine, or for that matter that the AR-15 comes with a 300 round magazine. Either one must be reloaded multiple times to fire so many rounds. Factoring in the reloading time, the record may show that the two weapons differ more-or less-than it appears here.”

74. Simply measuring the time required to fire one magazine and use it as a multiplier is misleading. If a shooter was able to fire 30 rounds in six seconds, one might assess the rate of fire as 300/minute. However, if the magazines contained 30 rounds each and required 2 seconds



per reload, it would not be possible for that shooter to fire 300 rounds in one minute. This is as true for handguns and shotguns as it is for rifles.

75. The magazine capacity and time required to reload are the same between an M-16 and an AR-15. To calculate “Actual firing capacity”, would require data on the differences between the systems in any given scenario, including, for example:

- Shooter capability – how fast can the shooter manipulate the trigger and manage recoil
- Recoil level of the firearm (for example, shotguns, typically, have more recoil than 5.56 rifles)

I do not currently have data on the above so am unable to accurately calculate the differences.

76. Based on the above, it is my opinion that references to rates of fire based on cyclic rate or rounds per minute are speculative, useless, inflammatory and misleading as an evaluative tool. And while actual firing capacity might provide a better metric, it requires specific evaluation data of real-life circumstances, which I do not have.

77. A more indicative tool might be what are referred to as “split times” – the time between shots. Reviewing videos of people conducting complete firings of magazines indicates the M-16 in fully automatic mode has a split time of approximately .07 seconds. Jerry Miculek, a *professional* shooter known for, among other things, his *exceptional* speed shooting skills, has video demonstrating his “split times” with an AR-15 rifle as averaging approximately .13 seconds. An online source on Miculek claims he currently holds 22 world records for speed shooting. It is not unreasonable to consider Miculek to be the fastest shooter to have ever lived. And even then, his actual firing capacity of an AR-15 is approximately half the actual firing capacity of virtually anyone familiar with firearms (not just a world-champion speed shooter) using a fully automatic rifle as that person is only required to pull the trigger one time. The actual firing capacity of the majority of shooters with the AR-15 would be even less than half that of the M-16, representing a significant difference between the two firearms.

### ***Comparing rifle cartridges to handgun cartridges***

78. It is well recognized that the projectiles fired by firearms chambered in rifle cartridges typically, though not always, have more potential to cause trauma than those fired by handgun cartridges.

79. As previously pointed out, the AR-15 family of firearms is available chambered in many handgun cartridges.

80. Based on my testing and experience, there is frequently little terminal difference between a handgun cartridge fired from a handgun vs. the same cartridge fired from a rifle/carbine.

81. Therefore, any statements comparing the terminal performance of AR-15 type weapons, without specifying the chambering, to any other weapon are incomplete and misleading.

***Ability to penetrate body armor***

82. Body armor is a broad term that encompasses many different models and materials. For the purposes of this discussion, we will address soft armor, commonly worn daily by many in law enforcement. As previously mentioned, one of my responsibilities in the FBI was conducting live-fire testing of body armor. Armor is classified by “Threat Level cartridge(s)”. This system recognizes that the key component is the projectile, not the firearm. Every centerfire rifle round I have ever tested proved capable of perforating level IIIA armor (the highest threat level soft armor I have encountered). The greater probability of armor perforation by centerfire rifle projectiles than handgun projectiles is well known, accepted and not limited to 5.56/.223. The .22LR, certainly will not defeat commonly used body armor, even if fired from a semiautomatic rifle with a pistol grip.

***Prohibited Features***


83. This law prohibits any semiautomatic firearm that has both the capacity to accept a detachable magazine and one or more of:

- pistol grip
- folding, telescoping, thumbhole, pistol or detachable stock
- flash suppressor
- shroud attached to the barrel that partially or completely encircles the barrel
- grenade launcher

84. As stated previously, none of the above attributes has any effect on the performance of the projectile (which bears sole responsibility for causing tissue damage) that is launched from the firearm.

85. In my opinion, with the exception of “grenade launcher”, these features can increase the ability to use the firearm safely and effectively for lawful purposes, like self-defense. If one believes these features improve the ability to accurately fire the weapon, that corresponds to improving the ability to control the firearm. Banning such features leads one to believe the state of Illinois wants only inaccurate, less controllable firearms in use by its citizens. Inasmuch as all firearms possess the ability to launch a projectile that may inflict lethal wounds, common sense would dictate that control enhancing features are a desirable attribute.

Dated: May 10, 2024

  
J. Buford Boone, III  
Declarant



# **EXHIBIT 1**



# Data Analysis of .223 Caliber Ammunition

# Penetration Capabilities of Law Enforcement Ammunition

**This presentation consists of data accumulated from the FBI's "Weapons Selection" test, San Diego County Sheriff's Department's "Structural Penetration Testing" and the Drug Enforcement Administration's "Construction Material Test" and is use with their permission**



# Purpose of ATF's Presentation

- ⇒ **Simplify data currently circulating in the Law Enforcement Community**
- ⇒ **Dispel myths about ammunition**
- ⇒ **Allow informed decisions of ammunition choice**
- ⇒ **Facts of Ballistic superiority**

# Basic Terminology

- ⇒ **Ballistics**
- ⇒ **Terminal Ballistics**
- ⇒ **Effective Penetration**

# Ballistics

⇒ The science dealing with the motion and impact of projectiles



# Terminal Ballistics

- ⇒ **How the projectile reacts once it hits an object**
- ⇒ **The projectile's effect on the object**



# Effective Penetration

- ⇒ 12 - 18 inches
- ⇒ Less than 12 inches, unlikely to reach vital organs from some angles
- ⇒ More than 18 inches, unlikely to damage additional vital organs





# Consideration of Under Penetration

- ⇒ **Failure to incapacitate subject**
- ⇒ **Subject may cause injury to Agents and innocent parties**



# Consideration of Over Penetration

- ⇒ Exits subject's body and wounds others
- ⇒ Some projectile's penetration can be increased as a result of penetrating through an intervening barrier (plywood, dry wall, steel)



# Ammunition and Weapon Consideration

- ⇒ **Operational use**
- ⇒ **Ballistic Superiority**
- ⇒ **Threat to Innocent Parties**



# Considerations for Operational Use

- ⇒ **A number of ATF arrests involved arrests take place in and around vehicles or making entry into residences**
- ⇒ **Vehicles provide cover and concealment for agents and suspects**
- ⇒ **Interior and exterior walls of a residence provide cover and concealment**
- ⇒ **There is an increasing number of suspects using body armor**



# Ballistics Superiority

- ⇒ **Shotgun (slug) and rifle/carbines are always ballistically superior to other choices**
- ⇒ **Handguns and subguns have similar ballistics**
- ⇒ **Shoulder weapons are tactically superior**
- ⇒ **Use of shoulder weapons will increase hit probability**



# Threat to Innocent Parties

- ⇒ Approximately 80% of rounds fired in Law Enforcement shootings miss the intended target according to FBI static's
- ⇒ All missed shots will eventually hit something
- ⇒ It is believed that the use of a shoulder weapon will increase hit probability
- ⇒ What happens next will depend on the projectile and what it hits



# How far will a projectile travel before it falls 60 inches to the earth?

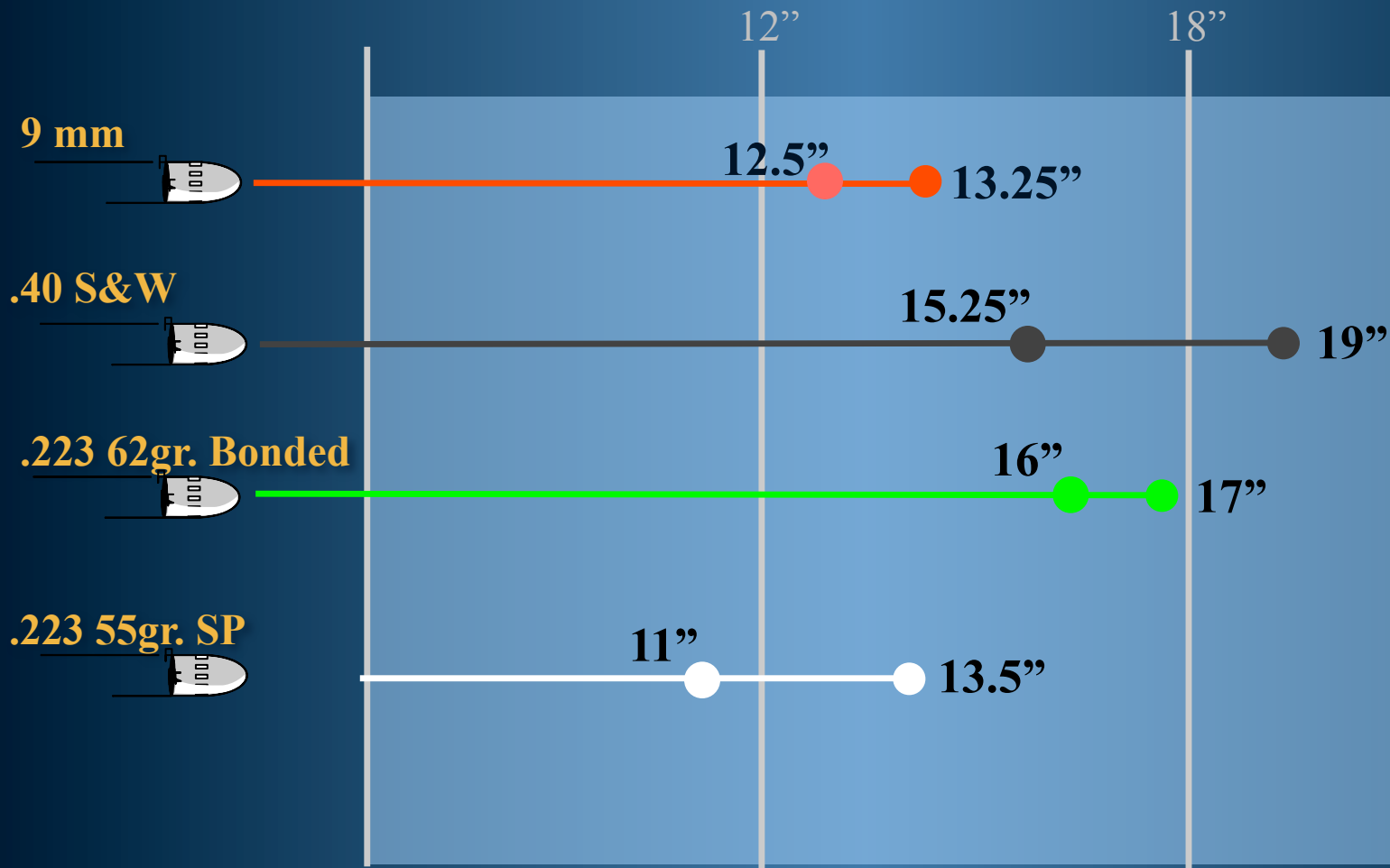
⇒ This calculation is based on the assumption that an average person would fire a weapon from a height of 60 inches, Center mass to a target at the same height.

- |                            |           |
|----------------------------|-----------|
| – 870 Shotgun - 12ga. Slug | 200 yards |
| – MP5 - 9mm                | 200 yards |
| – M-4 - .223cal.           | 500 yards |





# FBI Bare Gelatin Test







# Penetration Tests

- ⇒ **FBI penetration test**
- ⇒ **San Diego penetration test**
- ⇒ **DEA penetration test**

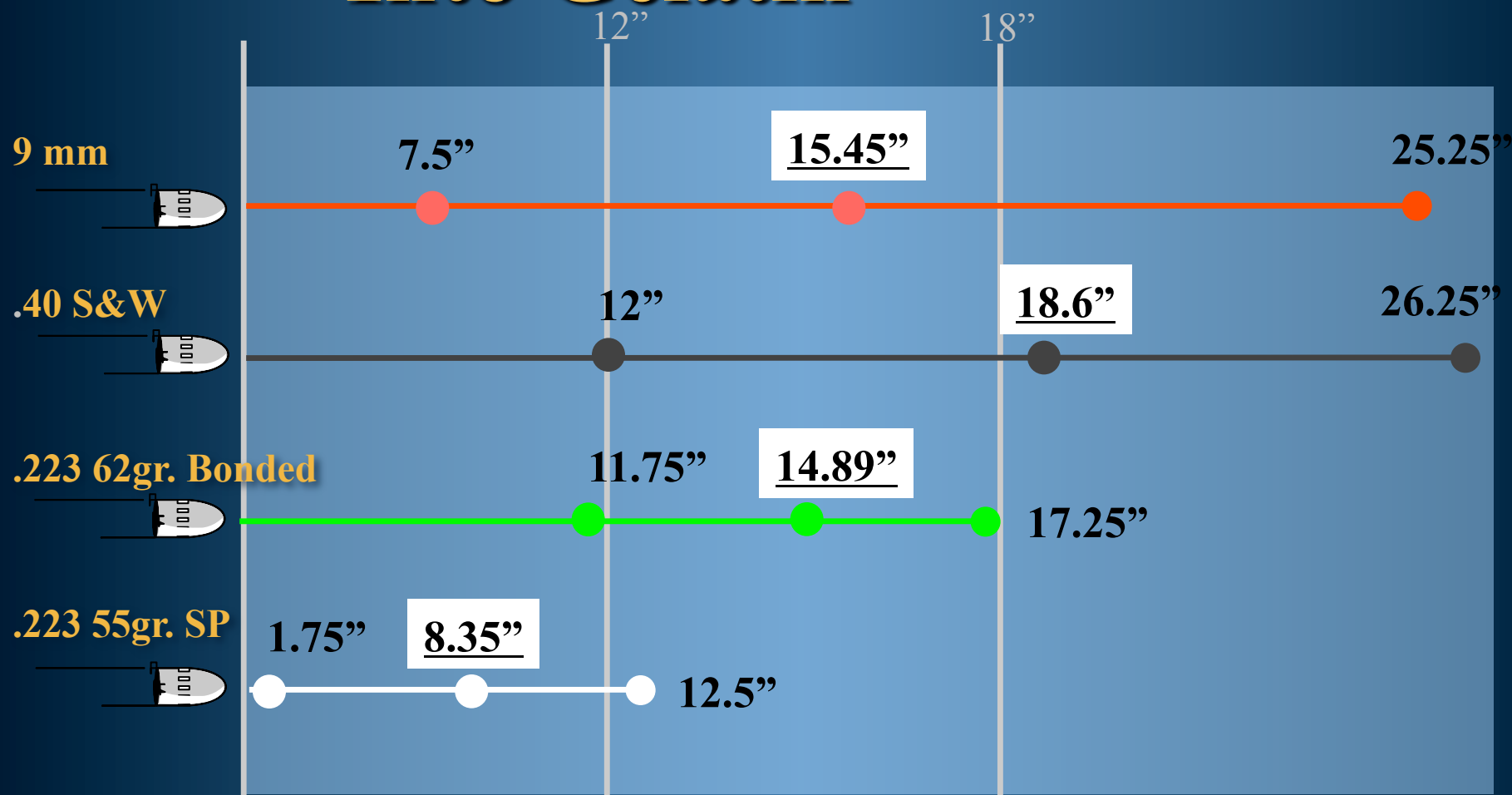


# FBI Penetration Test

- ⇒ Consisted of firing through a variety of different material barriers into ballistic gelatin
- ⇒ Barrier Materials
  - Steel car door
  - Automobile glass
  - Plywood
  - Drywall
  - etc.

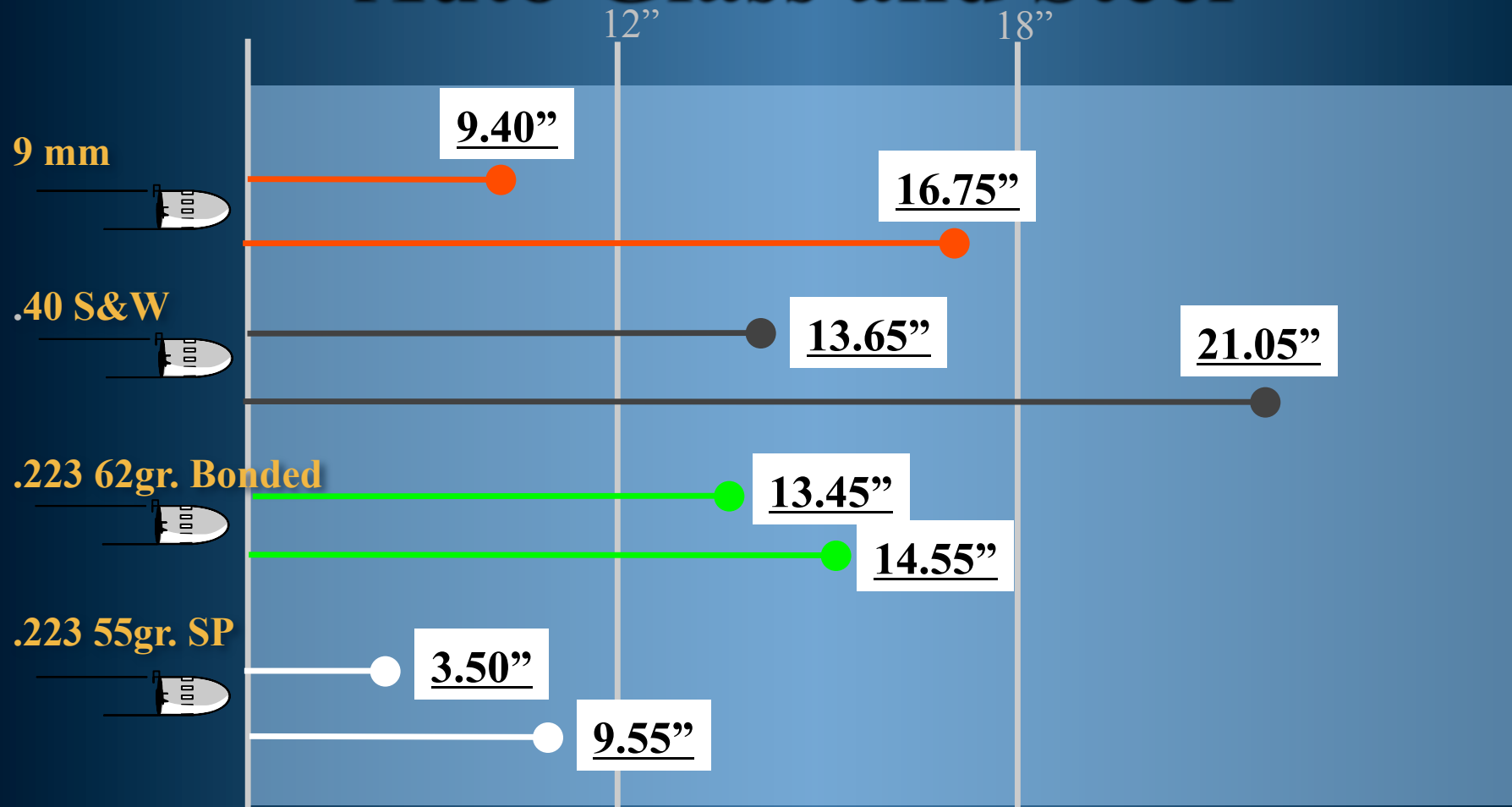


# Combined Penetration Averages Through Medium Into Gelatin





# Average Penetration Through Auto Glass and Steel





# **San Diego Wall Penetration Test**

**⇒ Consisted of firing rounds through 4 walls approximately 5 yards apart. The walls were constructed of various materials to include:**

- 1/2” Wood Siding**
- Stucco material**
- Insulation**
- 1/2” Gypsum**
- Cinder block**



# Combined Wall Penetration Averages



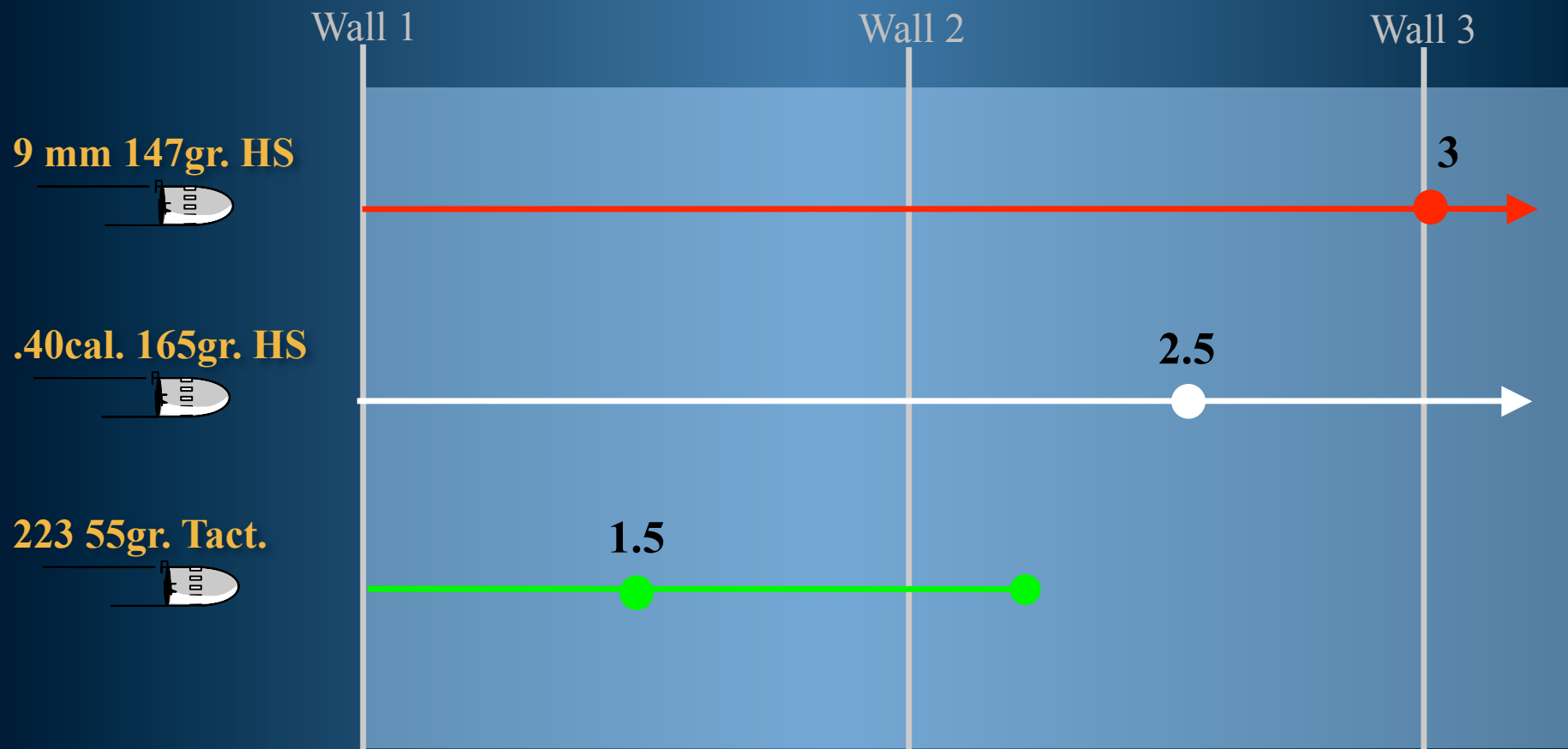


# DEA Wall Penetration Test #1

- ⇒ Consisted of firing rounds through 3 walls approximately 2 yards apart.
- ⇒ Wall #1 was constructed of:
  - 1 sheet of 1/16” plastic siding
  - 2 sheets of 7/16” plywood
  - 1 sheet of 9/16” hard insulation
  - 2” of soft insulation
  - 1 sheet of 1/2” drywall
- ⇒ Walls # 2 and #3 were constructed of:
  - 2 sheets of 7/16” plywood
  - 2 sheets of 1/2” drywall
  - 2” of soft insulation



# Combined Wall Penetration Averages







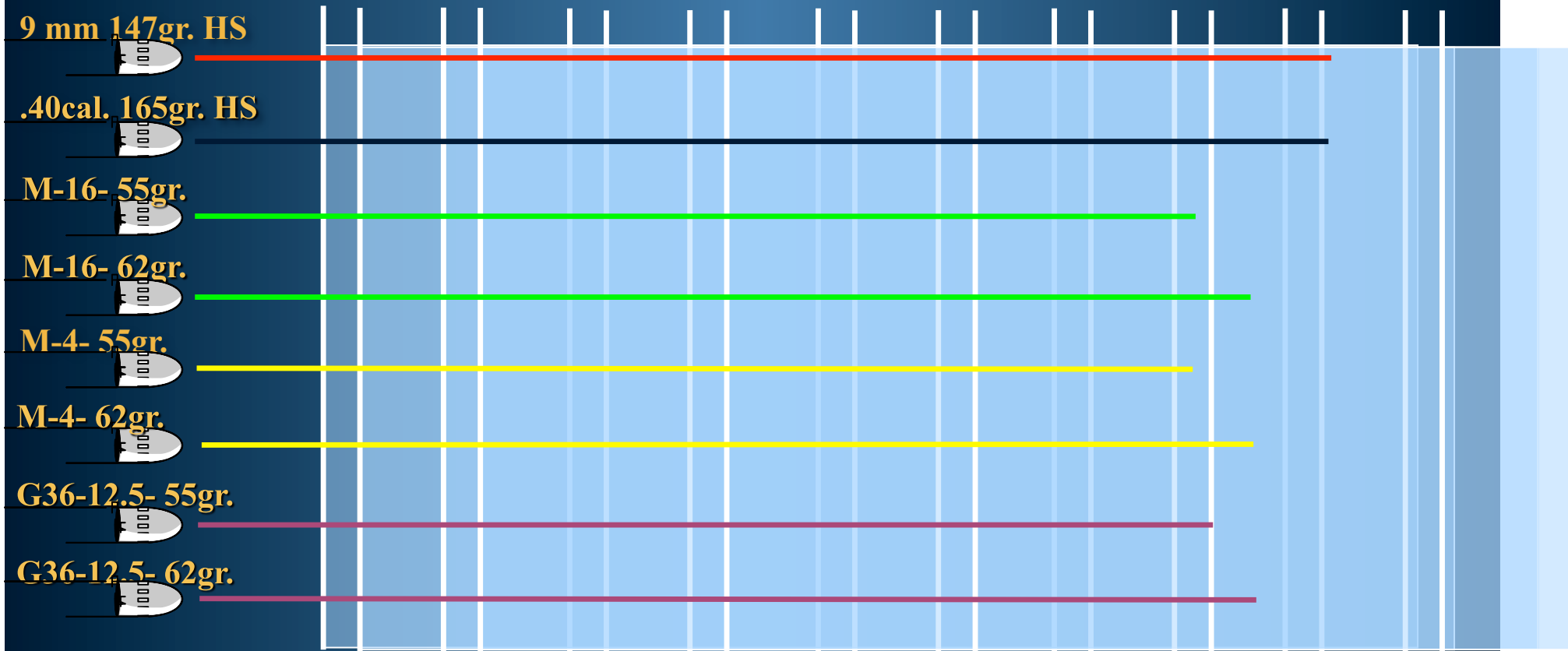
# DEA Wall Penetration Test #2

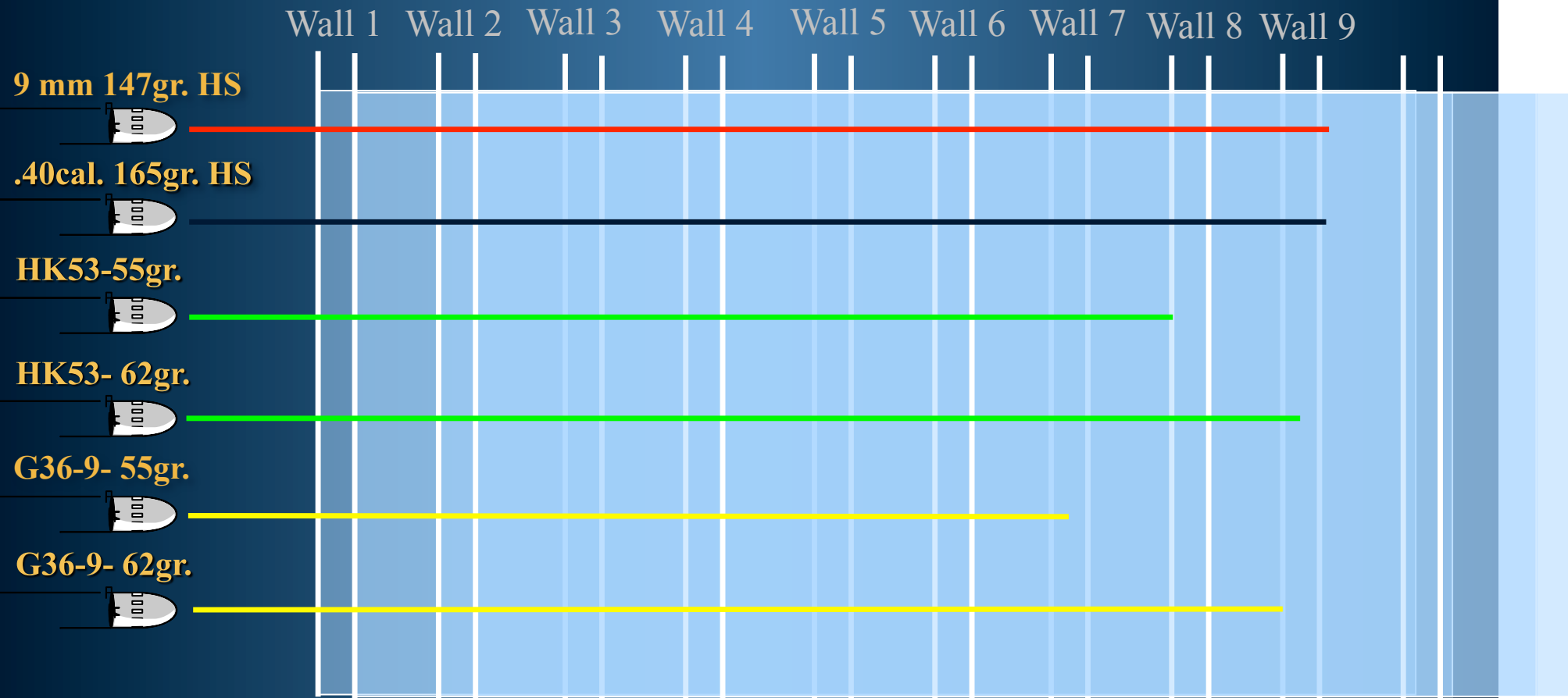
- ⇒ Consisted of firing rounds through 9 walls approximately 4 yards apart.
- ⇒ Walls #1 - #8 were constructed of:
  - 2 sheets of 1/2" drywall, this simulates the construction of an interior wall of a residence
- ⇒ Wall # 9 was constructed of:
  - 1 sheet of 1/2" drywall
  - 1 sheet of 7/16" plywood
  - 3" soft insulation
  - 9/16" hard insulation
  - 1/16" plastic siding, this simulates the construction of an exterior wall of a residence



## .223cal. 55 & 62gr.

**G36-12.5- 62gr.**







# Results of Data for ATF's Mission

⇒ **Weapon of choice**

✓ **Colt M4**



# **EXHIBIT 2**

**EXPERT WITNESS REBUTTAL REPORT OF J. BUFORD BOONE III**

*Caleb Barnett, et al., v. Kwame Raoul, et al.*  
United States District Court for the Southern District of Illinois  
Case No. 3:23-cv-209-SPM  
June 10, 2024

**Assignment**

I have been asked by counsel for the plaintiffs in the above described matter to provide my opinion on the following statements (shown in ***bold italics***) made by Dr. Stephen W. Hargarten, MD, MPH, and Mr. Phil Andrew, expert witnesses for the Defendant. This rebuttal sets forth my qualifications and foundation for my opinions. I offer these opinions to a reasonable degree of firearm, ballistic, law enforcement and scientific certainty and am willing and able to testify consistently with the contents of this report.

**Compensation**

I am being compensated for my time in this case at the rate of \$700 per hour. My compensation is not contingent on the results of my analysis or the substance of my testimony.

**Background and Qualifications**

I am currently the sole member of Boone Ballistics, LLC and a retired Supervisory Special Agent (SSA) of the Federal Bureau of Investigation (FBI). I was the primary SSA with oversight of the FBI Ballistic Research Facility (BRF) from April 15, 1997 – August 31, 2012.

As the Member of Boone Ballistics, LLC, I have been employed as an expert witness in civil and criminal cases. Additionally, I have been employed as a consultant in civil and criminal cases. I teach internal, external and terminal ballistics, including selection of ammunition and weapons for efficiently incapacitating an aggressive human adversary. I have lectured on the applicability of the Hague Convention of 1899 to the selection of ammunition for use by the U.S. Military. I conduct time of flight testing to better document small arms projectile flight as it applies to the use of a Ballistic Coefficient to predict projectile impact at long distances.

Prior to my first full-time law enforcement employment, I served as a reserve police officer or Deputy Sheriff with Tuscaloosa County, Alabama, Upson County, Georgia, Las Animas County, Colorado and Trinidad Colorado.

Approximately May of 1988 I was hired as a Police Officer with the Tuscaloosa, Alabama, Police Department. I was subsequently offered a position as a Special Agent of the Federal Bureau of Investigation (FBI) in July of 1988. I began employment with the FBI on 07/25/1988. I was graduated from the FBI Academy on 10/21/1988. My first duty station was New Haven, Connecticut.

I have maintained an interest in firearms all my adult life. I have shot competitively. My firearms scores at the FBI Academy were sufficiently high to allow me to attempt the "Possible" Club. I was successful on my first attempt. To shoot a "Possible", Agents must fire a perfect score on a very difficult course. Though there were in excess of 10,000 Agents in 1988, my "Possible" was approximately number 1,198 in FBI history.

Upon arrival in New Haven, I was assigned to the Reactive Squad conducting background, bank robbery and fugitive investigations. I later served as the Fugitive Coordinator for the New Haven Division. I was named "Detective of the Month" by the Bronx Homicide Task Force for the capture of an America's Most Wanted fugitive.

I successfully completed FBI Firearms Instructor School in July of 1989. This qualified me to teach firearms to Field Agents.

I was transferred to the Organized Crime/Narcotics Squad in July of 1990. I primarily participated in investigations of drug gangs. These investigations typically involved significant amounts of surveillance, electronic monitoring and the service of multiple search warrants. I also participated in organized crime investigations. I have participated in multiple arrests in urban and suburban areas.

I was named the Principal Firearms Instructor (PFI) of the New Haven Division of the FBI in November of 1992. I maintained that position until I transferred to the Firearms Training Unit at the FBI Academy, Quantico, Virginia.

As PFI, I oversaw all firearm and defensive tactics training of the 90+ Agents in the New Haven Division of the FBI. I coordinated training sessions for all firearms issued to general Agents. This included revolvers, pistols, carbines and shotguns. It also included coordination of deadly force training with the Principal Legal Advisor. During my time as the PFI, the FBI transitioned from revolvers to semiautomatic pistols. The training for this transition was my responsibility for New Haven Division Agents.

In September of 1989 I was admitted to the FBI New Haven Special Weapons and Tactics (SWAT) Team as a Sniper/Observer. I successfully passed both the two week Sniper/Observer and the two week Basic SWAT courses at the FBI Academy. I served operationally on the New Haven SWAT Team until my transfer to the FBI Firearms Training Unit at the FBI Academy, Quantico, Virginia.

In March of 1996, I was promoted to a position as a Term GS-14 Firearms Instructor at the Firearms Training Unit (FTU), FBI Academy, Quantico, Va. During this assignment, I performed line and PFI instruction of Agent trainees. I provided or oversaw line and combat instruction in handguns, carbines and shotguns. I also provided judgmental instruction utilizing Firearms Training Simulator (FATS) equipment. The FATS training was used primarily to teach Agents when the use of deadly force was appropriate, and when it was not.

I was transferred to the Ballistic Research Facility (BRF) of the FTU on April 15, 1997. I maintained my position at the BRF for more than 15 years, retiring on August 31, 2012. I received a permanent promotion to Supervisory Special Agent in September of 1997.

The BRF has responsibility for testing and evaluating all ammunition used operationally by the FBI. The BRF was created following a 1986 shootout wherein a subject was fatally injured by FBI projectiles but continued fighting and ultimately killing two Agents after receiving the “fatal” wound. A thorough investigation revealed the primary cause of the failure to rapidly incapacitate the subject was the projectiles lack of sufficient penetration in the subject’s body. It stopped short of the heart.

This investigation spawned research into the mechanics of wound ballistics. Ultimately, the research led to the creation of a scientifically repeatable method of comparing the potential effectiveness of individual cartridges. The resultant test has been referred to as the “FBI Method”. The BRF published test findings, available upon official request of Law Enforcement and Military agencies. The BRF became the most trusted source of ballistic information in the Law Enforcement and Military community.

As SSA of the BRF, my responsibility was to oversee all aspects of the research. I was the only full-time person at the BRF until a support person (non-Agent) was assigned as an Engineering Technician, Ballistics (ETB), in the last quarter of 1998. I was the Supervisor and rating official of the ETB.

As SSA, I performed or directed all functions of the BRF. I hand loaded cartridges, put test firearms together, hand-fired firearms for testing, built tissue simulant blocks, conducted penetration testing and reported on same. I created a relational database to store data and report test results. I operated sophisticated ballistic testing and photographic equipment. I was frequently sought out to train others in the use of this equipment.

I was the primary author of specifications for ammunition procurements for the FBI. This included ammunition used for training as well as for operational use, commonly referred to as “Service” ammunition.

I was the primary author of the FBI Body Armor Test Protocol at its inception.

I directed the creation of a procurement of 5.56mm NATO ammunition using piezoelectric conformal transducers for pressure testing.

The BRF served as the primary source of ballistic information regarding ammunition and firearms for all FBI Agents. Field Agents routinely referred local and state partners to me for ballistic information and advice.

During my service at the BRF, a strong liaison was formed with the Department of Defense (DOD). The BRF performed testing for and consultation with the DOD on many occasions. My expertise has been, and continues to be, sought out and relied upon by the Special Operations Community. During my service at the BRF, the Department of Defense Law of War Chair established protocol that all new DOD small arms munitions required testing and evaluation by the FBI BRF prior to legal authorization being granted for their use.



I have been a participant in a number of government sponsored Integrated Product Teams researching ballistics, including:

- Joint Services Wound Ballistics
- Lead Free Ammunition
- Protective Armor
- Armor Piercing Ammunition development

In 2002, I traveled to Darligen, Switzerland, at the specific request of the Department of State, to represent the United States in discussions of wound ballistics.

I have provided numerous live-fire terminal ballistic demonstrations to local, state and federal law enforcement officers as well as to all branches of the United States Military.

I have conducted international presentations on wound ballistics, ammunition selection, weapon selection, sniper operations and body armor.

I have briefed the Secretary of the Army and provided, at his request, my professional opinion of a 5.56mm NATO cartridge intended to replace the M855.

I have functioned (and continue to) as the primary instructor of 58 Basic Law Enforcement Sniper/Observer schools. Approximately 1,113 students have successfully completed this course under my instruction.

I consistently received high performance ratings in the FBI. I received the highest possible, "Outstanding", each of the last 4 years of my service. I have received numerous letters of commendation and performance awards.

I was the 2008 recipient of the National Defense Industrial Association Joint Armaments Committee's Gunnery Sergeant Carlos Hathcock Award.

I currently teach a two-hour basic wound ballistics class for recruits at the Law Enforcement Academy-Tuscaloosa, a branch of the Alabama Peace Officers Standards & Training Commission. I also teach an annual eight hour wound ballistics and ammunition selection class at the Tuscaloosa Police Department, Tuscaloosa, Alabama.

### **Publications**

Publications I authored during my FBI employment and restricted to official law enforcement or government request:

- Review of Accuracy 1st Training
- Weapon Selection – Revision III
- Ammunition Selection 2007
- TSWG MURG Briefing Accuracy Expectations
- AIM III TSWG Briefing 3/16/2010

Wound Ballistics  
B2 Sniper Rifle Cleaning Method

Publication I authored during my FBI employment that is publicly available:

FBI Body Armor Test Protocol

Publication that I have co-authored that is publicly available:

Terminal Ballistics: The Science of Ballistic Projectile Wounding

**Summary:**

Dr. Hargarten makes the error of assigning wounding capability to a firearm type as opposed to its barrel characteristics or the projectile it launches.

Absent employment as an impact weapon (i.e., striking or clubbing), a firearm's only physical contribution to creating trauma is the launching of a projectile. The totality of influence a firearm has on the projectile's wounding capability is in the launch velocity, both linear and rotational. Linear velocity is usually referred to as "Feet Per Second" or "Meters Per Second". Usually, though not always, a longer barrel results in higher linear velocity. Rotational velocity references the rate at which a projectile is spinning. Rotational velocity is a function of linear velocity and the rate of twist of the barrel.

The features used by Illinois to classify a firearm as an "assault weapon" have absolutely no effect on either the linear nor rotational velocity produced. A projectile launched by an "assault weapon" cannot have significantly different terminal performance than the same projectile launched by a non-"assault weapon," if the barrel characteristics are the same. And it is my understanding that Illinois does not take barrels into account in defining what is an "assault weapon."

Firearms fitting the general description of the AR-15 are available in chamberings from .22 rimfire to .338 Lapua Magnum. They are available in barrel lengths from less than 8" to at least 24" and twist rates from at least 1:12 to 1:3.

Any expert opinion on the wounding capabilities of AR-15 type rifles that fails to mention barrel characteristics, the cartridge for which it is chambered and the specific loading of that cartridge, is incomplete, misleading and, in many instances, simply wrong.

For example, the general proposition that *Assault weapons release projectiles at a relatively high velocity* is overstated and unsupported. Indeed, the Illinois law considers firearms chambered for rimfire ammunition, like the S&W M&P 15-22, chambered in .22 LR, to be "assault weapons," despite .22 rimfire ammunition being significantly lighter and lower velocity than typical .22 caliber centerfire ammunition. The Illinois law, like the general proposition noted above, does not address firearm caliber or chambering. Assault weapons chambered for

lower velocity ammunition, such as .45 Auto, simply do not “release projectiles at a relatively high velocity”.

Similarly, if one does want to describe the terminal performance of a projectile from a specific cartridge, aside from barrel characteristics, the firearm has little to do with it. A Federal LE223T3 (a common .223 cartridge) has almost exactly the same terminal performance if fired from a 16.5” AR-15 as if from a 16.5” bolt action rifle, so long as the chambers and rifling profiles match.

Dr. Hargarten has, correctly, identified velocity and mass as having influence on terminal performance. But the addition of the features that Illinois law uses to define a firearm as an “assault weapon” (listed below) have zero influence on terminal performance.

- A pistol grip or thumbhole stock;
- Any feature capable of functioning as a protruding grip that can be held by the non-trigger hand;
- A folding, telescoping, thumbhole or detachable stock or a stock that is otherwise foldable or adjustable in a manner that operates to reduce the length, size, or any other dimension, or otherwise enhances the concealability of the weapon;
- A flash suppressor;
- A grenade launcher;
- A shroud attached to the barrel or that partially or completely encircles the barrel, allowing the bearer to hold the firearm with the non-trigger hand without being burned, but excluding a slide that encloses the barrel

The opinion that such features have any relationship to wounding potential is indicative of a lack of firearms expertise.

Mr. Andrew seems to have made the assumption that all AR-15 type rifles are chambered in .223/5.56 NATO. Accordingly, his comments on terminal effectiveness cannot be relied upon for firearms chambered for other cartridges. As I explain below, and in my previous report in this matter, AR-15 type rifles can be chambered in a wide variety of cartridges.

Additionally, Mr. Andrew focuses much of his discussion of terminal effects on a report claiming performance never seen before or after the report was authored. The failure of the performance having ever been duplicated undermines the validity and reliability of the report.

### **Dr. Hargarten’s report**

#### **Paragraph 14**

*Assault weapons release projectiles at a relatively high velocity...*

This statement falsely assigns a velocity value to a type of firearm, instead of the cartridge for which that firearm is chambered or the firearm’s barrel length or rate of twist. It is an undisputable fact that two rifles with the same barrel dimensions (chamber, bore, length) will produce substantially identical velocity. Incorporating any of the features found in the Illinois

law, which classify the firearm as an assault weapon, will do absolutely nothing to change the velocity of the projectile fired.

“Assault weapons” as defined by the Illinois statute, are not caliber specific. They range in chamberings from .22 rimfire to at least .338 Lapua Magnum. Palmetto State Armory, just one of the scores of manufacturers of AR-15 type firearms, lists the following twelve AR-15 chamberings on its website<sup>1</sup>:

9mm Luger	.40 S&W	.45 ACP (Sic)	5.56 NATO
.223 Remington	.224 Valkyrie	6.5 Grendel	.300 Blackout
7.62x39	.300 Legend	.450 Bushmaster	.458 SOCOM

I am aware of several other chamberings for AR-15s. Firearms classified as “assault weapons” are capable of launching projectiles weighing between at least 36 and 300 grains. They are available in chamberings that launch projectiles from below the speed of sound to approximately three times the speed of sound.

In fact, Dr. Hargarten’s report contains data which contradicts his statement that “assault weapons release projectiles at a relatively high velocity....” He cites testing wherein a Thompson Machine Gun, certainly considered an “assault weapon” under Illinois law (in its semiautomatic form) but chambered in .45 Auto, produced a velocity of approximately 960 feet per second vs. a 5.56 NATO which produced a velocity of approximately 2,704 fps. Many people would likely agree with classifying 2,704 fps as “relatively high velocity” but I doubt anyone seriously discussing “assault weapons” would classify 960 fps as anything other than low velocity.

In a complete deviation from accepted ballistics reporting practices, the report Dr. Hargarten quotes is silent as to the specifics of the ammunition actually used for the testing. There are multiple cartridge choices in the calibers tested, yet we have no way of knowing what was actually tested as it is not specified. Different projectiles can be expected to perform differently, hence the wide variety of projectiles available.

I have personally tested 5.56 NATO loadings with at least 7 different projectiles. These projectiles exhibited differing terminal performance. We do not know what projectile was used in the tests Dr. Hargarten quotes as he does not identify them. His failure to do so renders his test unreliable.

***Assault weapons... can fire more bullets and thus release more kinetic energy per minute than other kinds of firearms.***

The firing rate of a non-banned semiautomatic weapon is the same as one that is banned, provided they are mechanically similar. Many of the features that make a firearm an “assault weapon” under the law (pistol grip, thumbhole stock, folding, telescoping or thumbhole stock, flash suppressor, etc.) do nothing to increase the rate at which the weapon can fire.

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<sup>1</sup> [A Guide to AR-15 Calibers | Palmetto State Armory](#)

Cyclic rate is a term the Sporting Arms and Ammunition Manufacturer's Institute (SAAMI) defines as:

The rate which a succession of movements repeats itself; in an automatic firearm, it is usually expressed in shots per minute that are theoretically possible to be fired, given an unlimited supply of ammunition<sup>2</sup>.

The automatic succession of movements in a semiautomatic firearm would be:

- Release of hammer or striking mechanism
- Impact of firing pin on primer
- Ignition of primer and propellant
- Launch of projectile
- Extraction of empty cartridge
- Ejection of empty cartridge
- Feeding of fresh cartridge
- Chambering of fresh cartridge

The time required for the above cycle does contain a bit of variability, depending on type of firearm. For example, a handgun chambered in 9mm Luger has less travel distance to extract, eject, feed and chamber a new cartridge than does one chambered in .223 because specifications for the .223 cartridge overall maximum length are almost twice as long as those for the 9mm Luger<sup>3</sup>.

In order for the fresh cartridge to be fired, the operator would be required to release the trigger. This would result in a resetting of the mechanism and then the operator would be required to press the trigger to begin the process over.

The process of the operator manually releasing and then pressing the trigger takes time. It would be very difficult, if not impossible, to arrive at a scientifically supported "average" time for a human to release and then press a trigger. What is beyond doubt, however, is that whatever that "average" might be, it is significantly slower than automatic fire, as the State's own expert, James Yurgealitis, has reported (see Paragraph 50 of Yurgealitis report executed May 10, 2024).

The cyclic rate of semiautomatic firearms in the same chambering should be expected to be substantially similar. In other words, an individual should be expected to have the same rate of fire utilizing a .223 Heckler & Koch SL6 as he would with a 5.56 NATO AR-15. As previously mentioned, the features which cause the AR-15 to be classified as an "assault weapon" do nothing to change its cyclic rate. Yet, the HK SL6 appears to not be banned by the Illinois law because it does not have the features that Illinois deems unlawful for semiautomatic rifles with detachable magazines.

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<sup>2</sup> [Glossary - SAAMI](#)

<sup>3</sup> [SAAMI Standards - SAAMI](#)

***Assault weapons cause extreme damage to the tissue and organs (especially to solid organs such as the liver and spleen) of shooting victims, leading to relatively high fatality and complication rates in victims. The Energy Release Of Bullets Fired By Assault Weapons Typically Results In More Destructive Potential Than From Other Weapons***

Dr. Hargarten, again, falsely assigns wounding capability to a type of firearm instead of the projectile launched by it. As has previously been shown, “assault weapons” fire projectiles in all categories of velocities. Semiautomatic rifles intended for self-defense, typically, have shorter barrels than similarly chambered rifles intended for hunting. Inasmuch as barrel length is typically a significant contributor to the velocity of projectiles fired in centerfire rifles, it is normal for the hunting rifles to produce higher velocity.

**Paragraph 15**

***Bullets cause damage to human bodies by transferring kinetic energy from the bullet to the body***

Factually, bullets cause damage by also crushing/cutting/tearing tissue as they pass through. Energy, alone, is not a valid metric for estimating or predicting damage. Consider a knife wound. It would have significantly less energy than a centerfire rifle projectile but is quite capable of causing severe tissue damage.

***The amount of energy a bullet transfers into a target is primarily a function of the bullet’s velocity and mass.***

This statement assumes that the projectile remains in the body. Many projectiles pass completely through, as shown by the Marquette University test results Dr. Hargarten lists in his report. Specifically, Paragraph 32 of his report references “measur[ing] the entrance and exit velocities of the bullet” to obtain certain calculations.

**Paragraph 16**

***As this equation indicates, the energy available to deliver to the target increases incrementally with increases in mass of the projectile, and exponentially with increases in the projectile’s velocity. That is, as the mass of the bullet increases, its contribution to the resulting kinetic energy is incremental while changes in velocity result in exponential increases in kinetic energy.***

Here, Dr. Hargarten correctly assigns energy to the projectile and its velocity, rather than to a type of firearm. This shows he understands it is the projectile which causes the damage and not the type of firearm that launched it, in contradiction to his earlier statements about “assault weapons” causing damage.

***Changes in velocity are therefore more significant for wounding capability than changes in mass.***

Dr. Hargarten’s own data/example of testing contradicts his statement. He compares a 5.56 NATO cartridge with an impact velocity of 826 m/s to a .30-06 with an impact velocity of 796

m/s. The 30-06 does have over twice the mass of the 5.56 but only 96% of the velocity. Even with the relatively small velocity loss, the 30-06 reportedly transferred almost twice the amount of energy into the gelatin block and made a larger Peak Diameter of Temporary Cavity, as he shows in the table found in paragraph 38 of his report.

**Paragraph 18**

***Fragmentation is also a factor in how much energy gets transferred. If a bullet fragments inside the body, it transfers and distributes more energy and potentially causes greater injury to adjacent tissue and organs.***

The above statement assumes that a projectile perforates (passes completely through) a body and ignores that some projectiles do not. A projectile which remains in a body has transferred all its kinetic energy, regardless of fragmentation or the lack thereof. Fragmentation of projectiles with normal spin rates is a function of the projectile and not the weapon used to launch it.

**Paragraph 24**

***We used three handguns (all pistols with .25 caliber, .32 caliber, and .40 caliber bullets), a bolt-action Remington hunting rifle (.30-06 caliber), an AR-15 style rifle (5.56 NATO bullets), a Thompson Machine gun rifle (.45 caliber ACP bullet), and a musket model (musket ball).***

The “Thompson Machine gun rifle”, as previously mentioned, contains features that, under Illinois law, would classify it as an “assault weapon” (if semiautomatic, which would have no effect on its ballistics) Note: I am unaware of a “Thompson Machine gun rifle” and suspect that Dr. Hargarten is actually referring to a Thompson submachine gun and continue my discussion from that point.

It is, however, chambered in a cartridge characterized by SAAMI as belonging to the class of “Centerfire Pistol and Revolver Ammunition”. Dr. Hargarten uses the term “.45 ACP” which is a commonly accepted nickname for a cartridge technically known as “.45 Automatic” or “.45 Auto”.

This chambering, much like most, is available in a wide variety of projectile types. The reader cannot possibly know the exact cartridge Dr. Hargarten used in his test as his report does not contain that information. We can tell the projectile mass was 14.904 grams (230 grains) and the impact velocity was 292 m/s (960 fps) but the report is silent as to projectile design. SAAMI lists three velocities for a 230 grain .45 Automatic: 830, 870 and 915 fps. SAAMI further states:

Ammunition tested subsequent to manufacture using equipment and procedures conforming to these guidelines can be expected to produce velocities within a tolerance of +/- 90 fps of the tabulated values<sup>4</sup>.

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<sup>4</sup> [SAAMI Z299.3-2022 - CFP&R Ammunition](#)



The projectile in Dr. Hargarten's example certainly falls within the expected parameters of velocity for a 230 grain .45 Auto projectile when fired from a 5" test barrel. Therefore, expected terminal performance is substantially identical despite being tested using an "assault weapon."

Furthermore, my experience with centerfire handgun cartridges such as the .45 Auto is that, unlike centerfire rifle cartridges, longer barrels do not necessarily equate to appreciably higher velocity. In some instances, the longer barrel will result in lower velocity. Cartridges are typically loaded with an expectation of the length(s) of the barrel(s) that will fire them. Handguns, virtually always, have shorter barrels than rifles.

A cartridge designed to work most efficiently in a short barrel can, when fired in a longer barrel, consume all propellant prior to the projectile's exit. The barrel travel, post propellant consumption, exposes the projectile to increased drag and, therefore, slows it down. Therefore, based on my testing and experience and SAAMI documents, it is unreasonable to believe a .45 Auto cartridge, when fired from a Thompson submachine gun would exhibit significantly different terminal ballistics than if fired from a 1911 type handgun.

Dr. Hargarten, once again, falsely credits firearm design features with terminal performance that is, correctly, credited to the projectile it has launched. He does this despite having admitted, in paragraph 16 of his report, that it is the projectile that "transfers energy."

He continues to make these claims, apparently disregarding statements found in one of the sources he cites, D.J. Carr et al, "The use of gelatin in wound ballistics research", International Journal of Legal Medicine 132(6) at 1659-64 (Apr. 25, 2018),<sup>5</sup>, such as:

*Understanding how different types of bullets interact with a target is critical to understanding wound ballistics, and therefore understanding bullet construction is important.*

*How a projectile interacts with, penetrates into and perforates through (if it does) the human body depends on many factors including (i) the type of projectile and (ii) where on the body the projectile impacts.*

*Different bullets result in different wound profiles due to how the bullet interacts with the target.*

#### **Paragraph 25**

***We used one round for each firearm tested. We fired two rounds in separate tests of the 5.56 NATO round.***

It is curious that two rounds of 5.56 NATO were tested but only one round of each of the others was tested. Dr. Hargarten's report is silent on the reasoning. As the variability is clearly shown by the disparity in Peak Diameter of Temporary Cavity for the two 5.56 NATO shots (5.4 vs. 7.2), a sample of one has absolutely no statistical significance.

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<sup>5</sup> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6208714>



Furthermore, Dr. Hargarten does not specify the 5.56 NATO round they tested. As I previously stated, I am aware of and have performed terminal testing on more than 7 different loadings of 5.56 NATO. They do not perform the same. Without ammunition specificity, the test results are meaningless and should not be relied upon.

**Paragraph 34**

***Occasionally a bullet will fragment when it enters the gelatin (which also occurs with human tissue). Energy transfer generally increases when a round fragments because energy is released into the fragments and spread over a greater surface area.***

Some of the photographs in Dr. Hargarten's report clearly show multiple fragments exiting the block of gelatin. The report, however, is silent on how the weight of the fragments are measured or calculated. Both photographs of 5.56 NATO indicate bullet fragmentation. Inasmuch as weight is a key component of the energy calculation, the claims on the amount of energy transferred by either of the 5.56 NATO shots is a guess, at best, and not founded in fact.

**Paragraph 37**

***To put this into perspective, the perpetrator of the mass shooting in Uvalde, Texas, was reported to have carried more than 1,600 rounds of ammunition with him on the day of the shooting. The total amount of energy that 1600 rounds represents is calculated by multiplying 1600 by the amount of joules that the 5.56 NATO released in the gelatin, or 1,760,000 joules.***

It is unclear why Dr. Hargarten uses this analogy, if not merely to sensationalize the issue. I have never seen the sum of energy from each round ever discussed in this way. It is not a normal ballistic measurement, as it tells nothing of relevance. Whether an individual cartridge or 1,600 cartridges are discharged from a firearm, the effect of the individual cartridge does not change. What's more, he says those rounds were "carried" by the shooter, not discharged. Rounds that are not fired represent no energy. In sum, this measurement is meaningless, misleading, and probably made to appeal to emotion rather than reason.

**Paragraph 42**

***I am also aware that the one firearm we tested that the Illinois statute does regulate (an AR-15 rifle), can be used with other calibers of ammunition that we did not test.***

Despite this admission that he is aware that the AR-15 is available in other calibers, Dr. Hargarten falsely continues in his report to credit weapon design with wounding capability, instead of the cartridge for which a firearm is chambered. It is a fact that the AR-15 originally was manufactured in .223 Remington but it is also a fact that it is widely available in an assortment of calibers, some smaller and some larger. It is also a fact that a bolt action .223 Remington rifle with a 24" barrel is expected to launch the projectile at higher velocity than the same cartridge fired from an AR-15 with a 20" barrel. This has everything to do with the barrel and nothing to do with the action type or any attached accessories.

#### **Paragraph 44**

***The significant differences in energy transfer and temporary and permanent cavity sizes associated with rounds fired by AR-15 style weapons as compared to rounds fired by other weapons (including on a per-minute basis) have direct implications for injury and death.***

To use but one example to prove this statement false, Glock manufactures 9mm pistols capable of accepting a 33 round magazine. There are AR-15 style firearms chambered in 9mm that are capable of accepting similar capacity magazines. As previously pointed out, the terminal performance of both is similar and the rate at which someone could fire them is substantially identical. Therefore, his statement, as written, is false.

#### **Mr. Andrew's Report**

##### **Paragraph 21**

***Footnote 4: I use the term "assault weapon" to encompass the weapons described in the definition of "assault weapons" in PA 102-1116.***

The law quoted does not assign a particular caliber to its definition of "assault weapon." Therefore, similar to Dr. Hargarten's report, any of Mr. Andrew's comments regarding the terminal performance of an "assault weapon" are meaningless without specific mention of the cartridge for which it was chambered.

##### **Paragraphs 27-33**

***Statements from US Department of Defense report AD343778.***

***One sustained a "[b]lack wound, which caused the thoracic cavity to explode." Another sustained a "[s]tomach wound, which caused the abdominal cavity to explode." A third sustained a "[b]uttock wound, which destroyed all tissue of both buttocks." The fourth sustained a "[c]hest wound," which "destroyed the thoracic cavity." And the fifth sustained a "[h]eel wound," whereby "the projectile entered the bottom of the right foot causing the leg to split from the foot to the hip."***

***"One round in the head – took it completely off. Another in the right arm, took it completely off, too. One round hit him in the right side, causing a hole about five inches in diameter. It cannot be determined which round killed the [individual] but it can be assumed that any one of the three would have caused death."***

***"Five [individuals] were hit, all five with body wounds, and all five [were] killed. Four were probably killing wounds with any weapon listed, but the fifth was essentially a flesh wound. The AR-15 made it a fatal wound."***

***"One man was hit in the head; it looked like it exploded. A second man was hit in the chest; his back was one big hole."***

The report, dated 20 August, 1962, contains examples of terminal performance that are incredible (not credible).

These claims are so ridiculous that they should, and actually do, cast doubt on the credibility of the report and those that present it as factual. I make this accusation because, in over 27 years of professional involvement in the field of wound ballistics:

1. I am unaware of similar claims prior to the report
2. I am unaware of similar claims after the report

The U.S. Military used larger caliber weapons before the adoption of the M16. For many years, the 30-06 was standard issue. It was replaced by the .308. Foreign militaries used comparable cartridges. Of all the people shot in WWI, WWII, and Korea, I have never seen claims of such performance.

Additionally, since adopting the M16 and 5.56 NATO cartridge (in several iterations), there have been hundreds of thousands, if not millions, of people shot by the system.

It is reasonable to believe that such performance, even if seen infrequently, would have been reported. Aside from this one report, it has not.

I have never heard, even anecdotally, of an incident wherein a person was decapitated or their upper body was severed from their lower body as a result of being shot by a single projectile fired from any small arm. It is notable that the .223/5.56 is on the lower end of terminal performance potential of the vast calibers available in centerfire rifles. In fact, the .223/5.56 is below the allowable minimum cartridges for deer hunting in some states, including Illinois, probably because its wounding potential, when compared to larger, commercially available cartridges, is limited. I suspect Illinois authorities see it as an inhumane option for hunting deer or other large game.

It is unreasonable to believe that the only time such performance would be documented was in the initial evaluation of the system; particularly, when that evaluation was based on actions during combat, not a controlled environment where variables could be measured and accounted for.

I have wondered about the origin of the report. Perhaps it was created in an effort to ensure the success of the AR-15 by overstating or embellishing performance. Another possibility is that wounds observed were incorrectly attributed to the AR-15 as opposed to other kinetic weapons (hand grenades, rockets, etc). I doubt the truth will ever be known. What we do know, however, is that level of performance has never been reported before or since so, even if it was true, it would be an anomaly and not data on which to base laws.

At the time of the report, the small statured SE Asian allies of the U.S. experienced difficulty with the full-size M14 U.S. battle rifles. The only smaller option in the inventory was the M2 Carbine, a weapon that launched a 110 grain projectile at less than 2,000 fps.

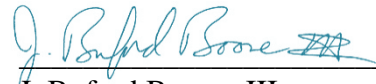
For comparison, the .308 Winchester (also a .30 caliber and the chambering of the M14) is fully capable of utilizing a 110 grain projectile. So loaded, SAAMI shows the velocity as being 3,150

fps. That would be a heavier projectile, loaded as fast as or faster than the 5.56 x 45mm NATO, yet, as far as I know, it was not considered.

Finally, it is telling that the U.S. Army has made the decision to switch to a cartridge that launches a larger (6.8mm) projectile than their current 5.56 x 45mm NATO loadings. The switch has begun but will, obviously, take a bit of time to complete. If the performance quoted in the Department of Defense report was factual, there would be no need to change cartridges.

Therefore, I do not believe the referenced reports should be given any credibility as factual, at least the portions discussed above.

Dated: June 10, 2024

A handwritten signature in blue ink, reading "J. Buford Boone, III", with a horizontal line extending to the right.

J. Buford Boone, III  
Declarant